FUNCTIONAL NEUROIMAGING AND WORKERS COMPENSATION

Accidental injuries involving concussions and post-concussion syndromes often involve litigation in a workers compensation setting. This is especially true when the MRI and CT scan do not show evidence of a brain injury.

The Mayo Clinic website defines "post-concussion syndrome" as concussion symptoms that last beyond the expected recovery period after the initial injury. The usual recovery period is weeks to months. These symptoms may include headaches, dizziness, and problems with concentration and memory. These symptoms may occur from a blow to the head, violent shaking, and movement of the head or body.

> "You don't have to lose consciousness to get a concussion or experience persistent post-concussive symptoms. In fact, the risk of developing persistent post-concussive symptoms doesn't appear to be associated with the severity of the initial injury."

www.mayoclinic.org/diseases-conditions/post-concussion-syndrome/symptoms-causes/syc-20353352?p=1.

Neuropsychiatric symptoms are common after concussion and are typically temporary - often resolving in seven (7) to ten (10) days. In some cases, the symptoms persist for months to years and cause cognitive impairments, emotional disturbances, and / or behavioral problems. Halbauer JD, Lew HL, Yesavage JA, "Neuropsychiatric Diagnosis and Management of Chronic Sequelae of War-Related Mild to Moderate Traumatic Brain Injury". J. Rehabil. Res. Dev. 46(f), 757 (2009).

The AMA's Guides to the Evaluation of Permanent Impairment, 6th Edition recognizes that there is a relationship between TBIs and emotional or behavioral impairment.

> "Emotional, mood, and behavioral disturbances illustrate the relationship between neurological disorders and mental and behavioral disorders. Emotional disturbances originating in verifiable neurologic impairments (e.g., stroke or head injury) are assessed using the chapter… Psychiatric features can range from irritability to outbursts of rage or panic and from aggression to withdrawal."

Rondinelli R., "Guides to the Evaluation of Permanent Impairment Sixth Edition", (2008), Section 13.3f, p. 332 & 333.

Workers' compensation claims involving concussions with persistent symptoms produce allegations of malingering and / or allegations that the source of the claimant's continued problems is personal and psychologically-based. The cases also include an unusual number of expert opinions. This appears largely based on the absence of objective evidence of structural damage despite the use of CT scans or MRIs.

However, damages from concussions usually are not seen with these types of structural tests.

> "By definition, concussion is distinguished from more severe forms of traumatic brain injury by the absence of observable changes on structural CT and MRI."

Rao S. "Brain Activity After Concussion; fMRI Studies Show a Shift in Activation a Lasting Neural Signature", found at https://consultqd.clevelandclinic.org.

Potter v. State of Kansas, 318 P.3d 1019 (unpublished opinion) (Kan. App. 2014), illustrates the typical issues of causation and credibility found in a claim involving post-concussion symptoms. On March 1, 2009, Nancy Potter - while working the night shift - slipped and fell on an icy sidewalk. Her knees, stomach, and right cheekbone made contact with the concrete. Dr. Kelly - a neurologist - saw Potter on three (3) occasions. She complained of memory loss and dizziness. She also complained that she was making verbal errors, could not spell, had trouble doing math, and had trouble with complex

reasoning. Dr. Kelly said that it was significant - from a causation standpoint - that she "really hadn't had much of a blow to the head … (and) hadn't lost consciousness".

A total of six (6) experts testified in the matter. The expert's opinions varied greatly with several indicating that the continuing symptoms were unrelated to the work accident since there was no radiographic evidence of structural change.

This is a common fact pattern in concussion cases. The claimant was not unconscious - or was only briefly unconscious. The MRI or CT scan shows no objective evidence of damage. Behavioral presentations mix with physical presentations. Expert opinions vary widely regarding causation and the credibility of the claimant's presentation. See also Houston v. Johnson County Nursing Center, 2020 WL 3631186 (WCAB 2020); Smith v. Home Town Health Care, LLC, 2020 WL 535050 (WCAB 2020); Turk v. St. Francis Health Center, Inc., 2020 WL 6540866 (WCAB 2020); Collins v. Irish Express, Inc., 2019 WL 7546799 (WCAB 2019); Arden v. State of Kansas, 2019 WL 2903427 (WCAB 2019).

Is there a solution to this type of "credibility issue"? Is there an objective standard to show post-concussion difficulties in the brain?

A regular MRI looks at brain structure and integrity. While it is helpful for diagnosing structural brain damage, it can't often be used to detect post-concussion syndrome.

A regular MRI uses magnets to look at protons in water. In a brain MRI, that means looking at soft tissue in the head. It does not show bone well but will show the structure of the brain since that is where the water is. With mild TBI, the standard brain tests do not show abnormalities since the tissue is not damaged in any obvious way.

Post-concussion syndrome impacts the ability of neurons to signal for the right amount of blood to accomplish certain processes but does not cause structural degradation to the cells themselves.

Functional neurocognitive imaging can provide information about how oxygen is carried to different regions of the brain. It can detect the dysfunctional communication caused by post-concussion syndrome. Dr. Mark Allen, “Can an MRI Detect Post-Concussion Syndrome?” found at www.cognitivefxuse.com/blog/can-an-mri-detect-post-concussion-syndrome.

There are a several techniques that produce real-time images of the brain activity - functional MRI (fMRI), Positron Emission Tomography (PET), and Single Photon Emission Computerized Tomography (SPECT).

The fMRI uses the properties of the blood oxygenation to obtain a dynamic picture of function - taking advantage of the brain’s need for oxygen-rich blood to perform necessary tasks. Oxygenated blood reacts to the magnet differently than deoxygenated blood which allows for real-time quantitative monitoring of brain metabolic activity. Baskin, Edersheim & Price, “Is a Picture Worth a Thousand Words? Neuroimaging in the Courtroom”, American Journal of Law & Medicine 33 (2007) 239-269.

A study published in the Journal of Neurotrauma studied 75 patients - ages 18 to 55 - with fMRI and applied sophisticated statistical analysis. The study revealed patterns of brain activity that – six (6) months later - were associated with worse performance on behavior and cognitive tests. The research was built on previous studies related to resting-state brain connectivity. See https://cond.ucsf.edu/news/using-fmri-predict-long-term-concussion-complications. See also “Wing, Tucker, Fong & Allen, “Developing the

Standard of Care for Post-Concussion Treatment: Neuroimaging-Guided Rehabilitation of Neurovascular Coupling", The Open Neuroimaging Journal, www.benhamopen.com.

Neuroimaging and neuroscience have long been used in criminal courts as a defense or as a mitigating factor. Over 40 years ago, John Hinckley's attempted assassination of President Ronald Regan led to a highly-publicized use of neuroscience. Hinckley's defense team introduced a CT scan of the brain to bolster the argument that he suffered from schizophrenia and should - therefore - be found not guilty by reason of insanity. Aona, Yaffe & Kober, "Neuroscientific Evidence in the Courtroom: A Review", (2018) found at https://doi.org/10.1186/s41235-019-1179-y.

In an analysis of US cases between 2005 and 2012, there were 1,585 judicial opinions in criminal cases that mentioned the defense use of neuroscience or genetic evidence. Farahany, N.A. (2016) "Neuroscience and Behavioral Genetics in U.S. Criminal Law; An Empirical Analysis", Journal of Law and the BioScience, 2 (3), 485-509.

One of the first civil cases to utilize information from an fMRI involved challenges to State statutes curbing the sale of violent video games to children. In these cases, experts proffered the fMRI evidence to demonstrate a connection between watching violent video games and aggressive behavior in children. See Brown v. Entertainment Merchants Ass'n, 564 U.S. 786, 131 S.Ct. 2729, 180 L.Ed. 2d 708 (2011). This case was not decided based upon the fMRI, but upon first amendment grounds.

In his dissent, Justice Breyer cited many studies - including functional neuroimaging studies - demonstrating a relationship between violent video games and violent behavior. He stated:

> "Cutting-edge neuroscience has shown that 'virtual violence in video games playing results in those neural patterns that are

> considered characteristic for aggressive cognition and behavior."

Entertainments Software, 131 S.Ct. at 2768.

Functional MRIs have even been proposed as "lie detectors". Wilson v. Corestaff Services, L.P., 900 N.Y.S. 2d 639 (N.Y. Sup. Ct. 2010) involves a lawsuit of a former employee who claimed to be fired in retaliation for reporting sexual harassment in the workplace. The plaintiff proposed an expert witness who would testify about the truthfulness of a key fact witness through fMRI lie-detection testimony. The Court refused to admit the testimony under New York's modified Frye test. The Court noted that the use of fMRI to show a person's past mental state or to gauge credibility is far from generally accepted. Beecher-Monas, Garcia-Rill, "Overselling Images: fMRI and the Search for Truth" 48 J. Marshall L. Rev. 651 (2015).

There are very few Kansas workers compensation cases where these advanced scans were used to prove or dispute a claimant's allegations of injury. For example, in Siler v. 512 U.S.D., 2009 WL5385873 (WCAB 2009), the claimant was struck by lightning. An agreed award was entered into leaving open the right to future medical treatment. The claimant came under the care of Ravindran Sabapathy, Psy.D, a licensed clinical psychologist. She was diagnosed with PTSD, major depressive disorder, and chronic pain. It was recommended that she receive psychotherapy and pain therapy with biofeedback.

The respondent denied this request for medical treatment and a hearing was scheduled. The respondent set an independent medical evaluation with Patrick Hughes, M.D. Dr. Hughes discounted the claimant's complaints of severe and disabling pain. He noted the lack of evidence of neurological / neuronal injury - as evidenced by both a PET

scan and a SPECT scan of the brain - as might occur from exposure to electricity. See also Hitchcock v. USD No. 214, 1997 WL 762966 (KWCAB).

This testing - although relatively new - should be admissible in Kansas workers compensation cases. The Kansas Workers Compensation Act does not require the use of a particular evidentiary standard to admit expert medical testimony.

> "Given the relative equality that exists in compensation cases between lay testimony and expert testimony, it does not appear that claimant has any burden to show that his (or her) medical evidence meets any particular standard. A claimant's burden of proof in a workers compensation case is to prove that it is more probably true than not true that he or she suffers from a disabling condition which is the result of his or her work."

Armstrong v. City of Wichita, 21 Kan. App. 2d 750, 758, 907 P. 2d 923, rev. denied 259 Kan. 927 (1996). The Court of Appeals did not require that the physician's diagnosis of the claimant's condition or an opinion on causation meet the test for admission set forth in Daubert v. Merrill Dow Pharmaceuticals, 509 U.S. 579 (1993) or Frye v. U.S., 293 F.1013 (D.C. Cir. 1923).

The use of functional neuroimaging appears to helpful both in diagnosis and treating the long term effects of concussion.